

[001] HYDRODYNAMIC TORQUE CONVERTER

[002]

[003]

[004] The invention concerns a hydrodynamic torque converter of the type defined in greater detail in the preamble of Claim 1.

[005]

[006] Hydrodynamic torque converters of this type comprise a converter housing which is connected to a drive engine. The engine or the converter housing forms the drive unit and drives a pump impeller. The turbine rotor forms the drive output and is preferably connected to a change-under-load transmission, in particular for working machines such as wheel loaders or stackers. The pump impeller wheel can be connected to the drive by a clutch.

[007] DE 195 21 458 A1 discloses an electro-hydraulic control device for the drive of a machine with a hydrodynamic torque converter, in which the pump impeller wheel can be connected to the drive by a clutch.

[008] The purpose of the present invention is to provide a hydrodynamic torque converter in which the pump impeller wheel can be connected to the drive by a clutch, and in which the said clutch can be controlled with precision.

[009] This objective is achieved with a hydrodynamic torque converter of the type described, which also has the characterizing features of the principal claim.

[010]

[011] According to the invention, the pump impeller wheel can be connected to the converter housing by a clutch, the actuating device of the clutch being a piston on one side of which acts the internal pressure of the converter and on the other side of which acts the clutch actuation pressure. Depending on which pressure predominates, the clutch is actuated to close or open. The resulting force, which acts on the piston, is the net force produced by the differential pressure between the actuation pressure and the pressure inside the converter housing. Since the pressure inside the converter housing varies according to the operating conditions

of the hydrodynamic torque converter, the clutch can only be controlled with precision if the actuation pressure takes into account the moment-by-moment pressure inside the converter housing. For this purpose, the pressure in the converter housing is measured by a pressure sensor, preferably at a tapping point close to the piston of the clutch actuation device. The signal from the pressure sensor is fed to an electronic control device, which emits control signals for the actuation pressure of the clutch as a function of the internal pressure. Preferably, the pressure is determined by a pressure sensor arranged in a component whose position is fixed. Preferably, this positionally fixed component is connected to the inside space of the converter by a rotary connection and a pressure line. Preferably, the pressure line opens close to the piston inside the converter housing.

[012] It is also possible to feed the pressure inside the converter housing to the tapping point of a hydraulic control unit, which regulates the clutch actuation pressure as a function of the pressure inside the converter.

[013] In another embodiment, the piston can have apertures through which the pressure medium, which acts directly on the piston, transmits the pressure to the pressure sensor. Preferably, the duct for transmitting the pressure is arranged inside the converter housing.

[014] In a further embodiment, in the positionally fixed component in which the pressure sensor is arranged, there is also a bore through which the pressure medium is fed into the clutch actuation space. The positionally fixed component can also have a bore through which a coolant liquid is fed into the space inside the converter housing, this liquid flowing continually through the converter to cool it.

[015] In a further embodiment the positionally fixed component is connected to the stator of the hydrodynamic torque converter.

[016] Since the pressure sensor determines the momentary internal pressure acting on the piston and transmits it to an electronic control unit, the actuation pressure can be varied as a function of the converter's internal pressure and the clutch can, therefore, be controlled with precision.

[017]

[018] Other characteristics emerge from the description of the figures, which show:

[019] Fig. 1 is a torque converter with apertures in the piston; and

[020] Fig. 2 is a torque converter with a pressure line in the converter housing.

[021]

[022] Fig. 1:

A converter housing 1, which is in rotationally fixed connection with a drive engine (not shown), can be connected to a pump impeller wheel 3 by a clutch 2. A turbine rotor 4 is in rotationally fixed connection with a shaft 5 which constitutes the drive output and is preferably connected to a change-under-load transmission. Via a line 6, coolant liquid is continuously fed into an inside space 7 of the converter, whereby, as a function of the quantity of coolant liquid and the operating condition of the hydrodynamic torque converter, a pressure is produced in the inside space of the converter, which acts on a first side 8 of a piston 9 of the actuation device for the clutch 2. Pressure medium is fed to a second side 11 of the piston 9 via a pressure feed line 10. The net pressure force acting on the piston 9 is determined by the difference between the pressure forces acting on the first side 8 and on the second side 11 of the piston 9. To enable precise control of the clutch 2, the pressure force acting on the second side 11 must be adjusted as a function of the constantly varying pressure force acting on the first side 8. For this purpose, a pressure sensor 12 preferably arranged in a positionally fixed component 13 determines the pressure acting on the first side 8 of the piston 9, via a first pressure line 14, a rotary connection 15, a second pressure line 16 and apertures 17 in the piston 9. Since the second pressure line 16 and the apertures 17 are arranged in the direct vicinity of and thus close to the first side 8, the pressure sensor 12 can determine with precision the pressure acting on the first side 8. Preferably, the line 6, the pressure feed line 14 and the pressure sensor 12 are arranged within the positionally fixed component.

[023] Fig. 2:

The hydrodynamic torque converter of Fig. 2 works in a manner analogous to the torque converter of Fig. 1, but such that the torque converter of Fig. 2 actuates the clutch 2 in its opening direction when the converter's internal pressure, which acts on the first side 8 of the piston 9, is greater than the actuation pressure acting on the second side 11 of the piston 9. The clutch 2 in Fig. 1 is actuated in the opening direction when the actuation pressure acting on the second side 11 of the piston 9 is greater than the actuation pressure acting on the first side 8 of the piston 9. Accordingly, the piston 9 in Fig. 2 needs no rotationally fixed connection to the converter housing, since when the clutch 2 is closed the piston 9 has the same rotation direction as the disk of the clutch 2. Therefore, it is possible for the line 16 to open directly into the pressure space which acts on the first side 8 of the piston 9, so that the pressure sensor 12 can determine the pressure within that space. Apertures 17 such as those on the piston of Fig. 1 are not needed.

Reference numerals

- 1 Converter housing
- 2 Clutch
- 3 Pump impeller wheel
- 4 Turbine rotor
- 5 Shaft
- 6 Feed line
- 7 Inside space of the converter
- 8 First side
- 9 Piston
- 10 Pressure feed line
- 11 Second side
- 12 Pressure sensor
- 13 Positionally fixed component
- 14 First pressure line
- 15 Rotary connection
- 16 Second pressure line
- 17 Apertures